

# Field Evaluation AQMesh Monitor (v.3.0)



# Background

- From 09/27/2014 to 01/14/2015 four AQMesh (v.3.0) gaseous monitors were deployed in Rubidoux and run side-by-side SCAQMD Federal Reference Method (FRM) instruments measuring the same pollutants
- AQMesh (4 units tested):
  - Electrochemical sensors (**non-FEM**)
  - Each unit measures: CO, NO, NO<sub>2</sub>, SO<sub>2</sub>, and O<sub>3</sub>
  - **Unit cost: ~\$10,000**
  - Time resolution: 1- or 15-min
  - Units IDs: #83150, #495150 (until 11/12/2014), #574150 (starting on 12/08/2014), #90150
- SCAQMD FRM instruments:
  - CO instrument; **cost: ~\$10,000**
    - Time resolution: 1-min
  - NO<sub>x</sub> instrument; **cost: ~\$11,000**
    - Time resolution: 1-min
  - SO<sub>2</sub> instrument; **cost: ~\$13,000**
    - Time resolution: 1-min
  - O<sub>3</sub> instrument; **cost: ~\$13,000**
    - Time resolution; 1-min

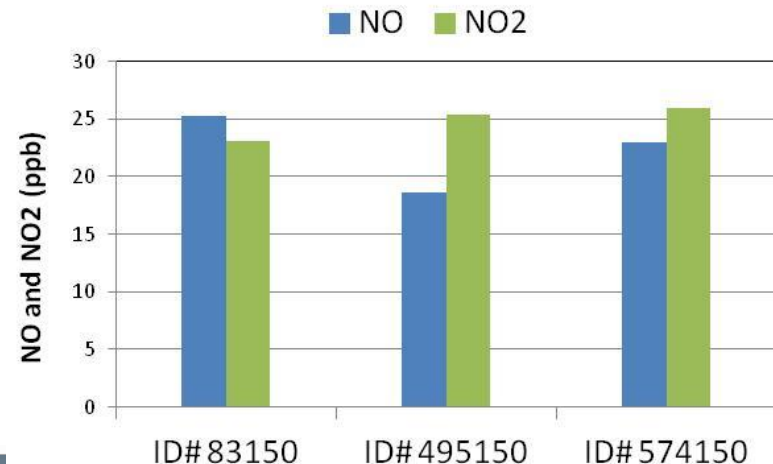
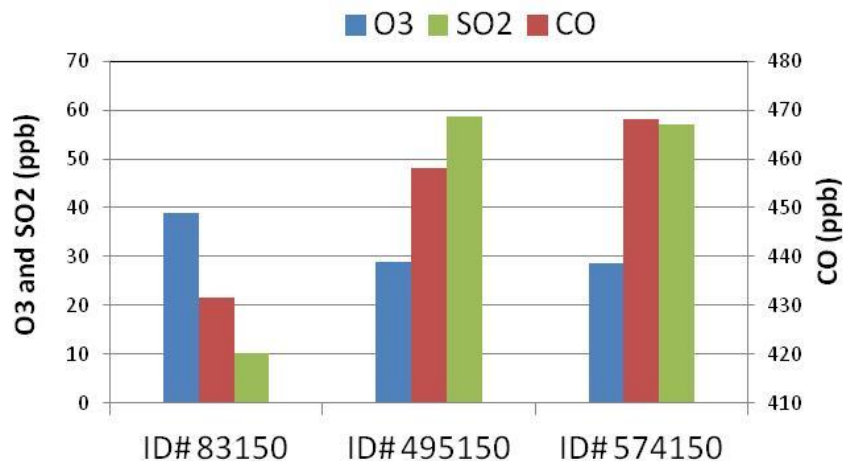


# Data validation & recovery

- Basic QA/QC procedures were used to validate the collected data (i.e., obvious outliers, negative values, and invalid data-points were eliminated from the data-set)
- Because of a malfunction, AQMesh ID# 495150 operated until 11/12/2014 and was replaced by AQMesh ID# 90150 on 12/08/2014
- Data recovery for all units was very high (i.e. >96%)

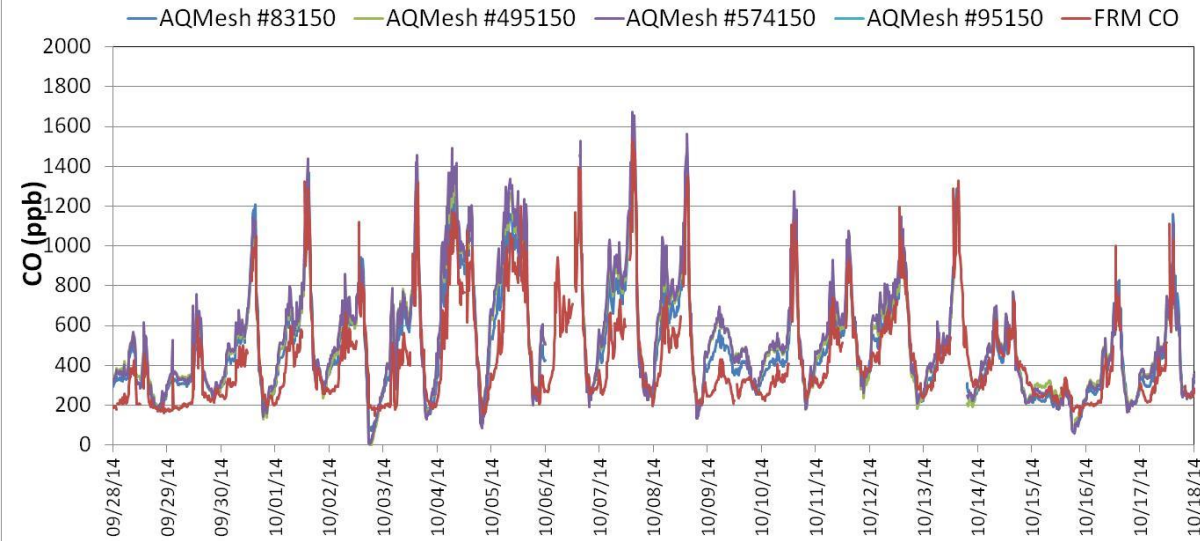
## AQMesh; intra-model variability

- Substantial measurement variations were observed between the four AQMesh units and for all measured pollutants except NO<sub>2</sub>

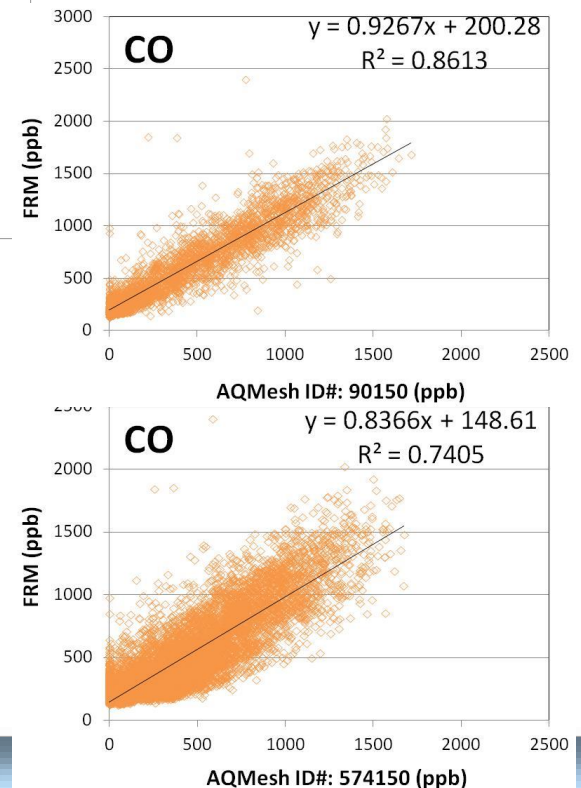
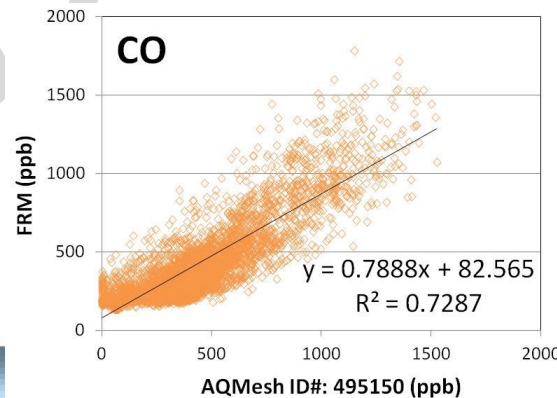
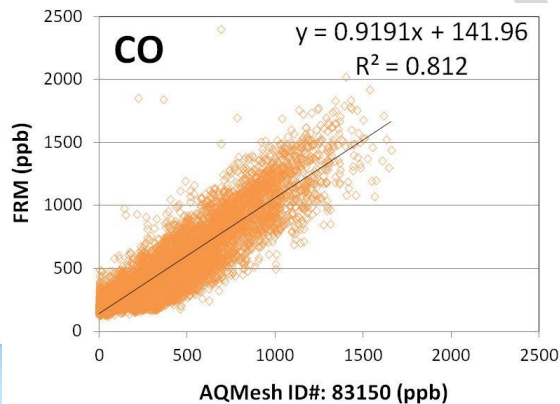


# AQMesh vs FRM (CO; 15-min ave)

AQMesh vs FRM CO

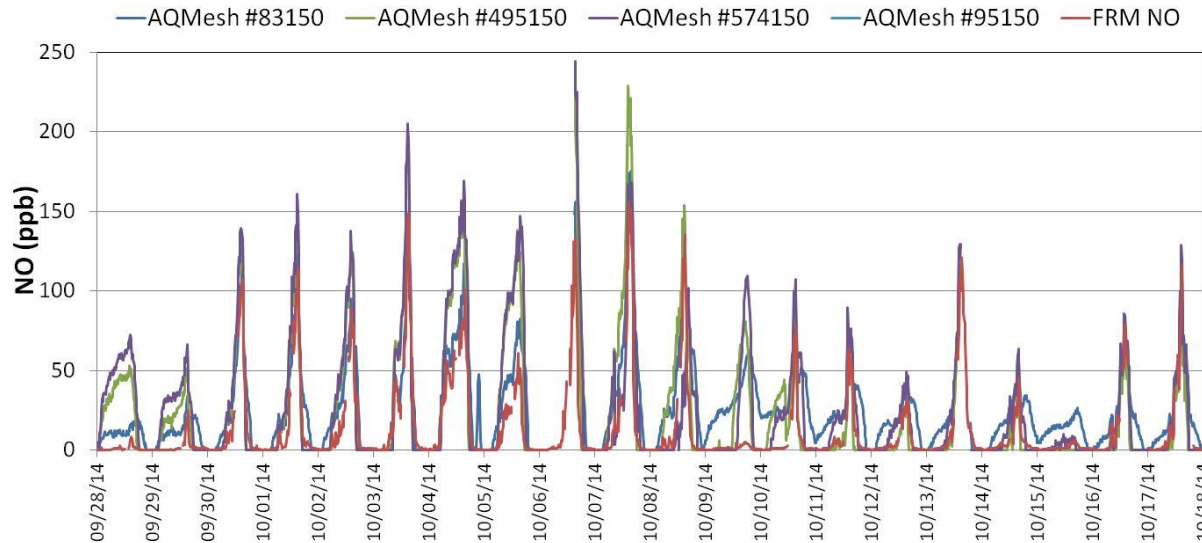


- Overall, all AQMesh CO measurements correlate well with the corresponding FRM data ( $0.72 < R^2 < 0.86$ )
- Wide variation in correlation slopes reflects high intra-model variability

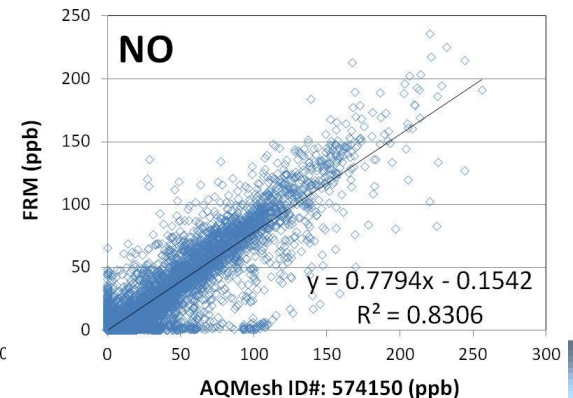
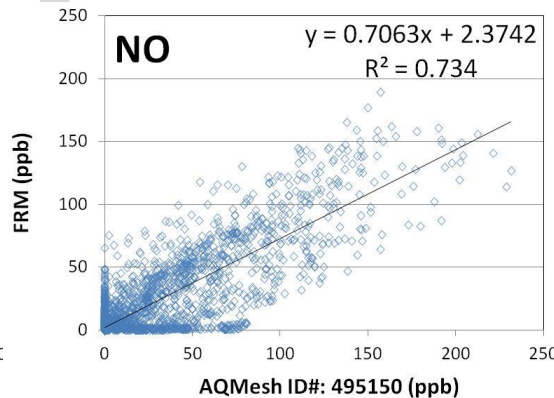
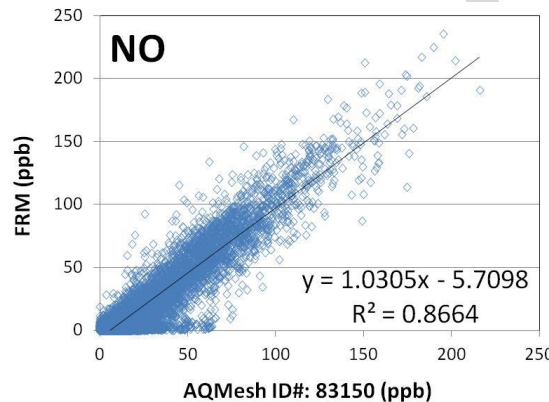
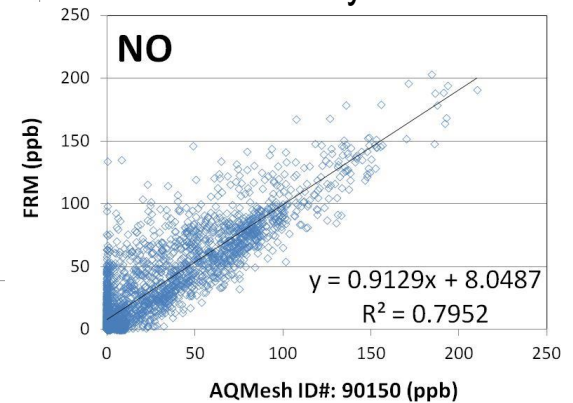


# AQMesh vs FRM (NO; 15-min ave)

AQMesh vs FRM NO



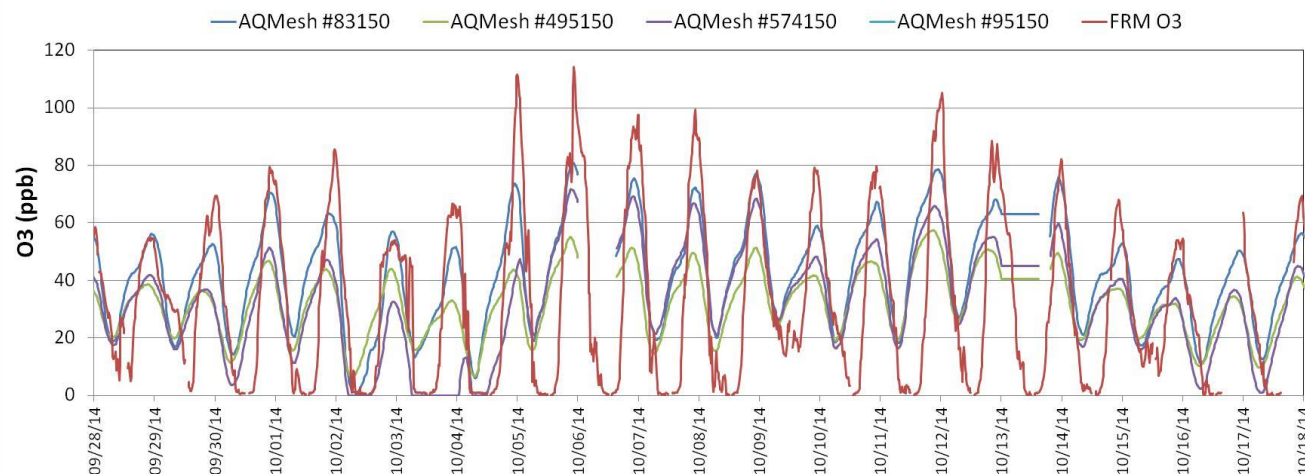
- Overall, all AQMesh NO measurements correlate well with the corresponding FRM data ( $0.73 < R^2 < 0.86$ )
- Wide variation in correlation slopes reflects high intra-model variability



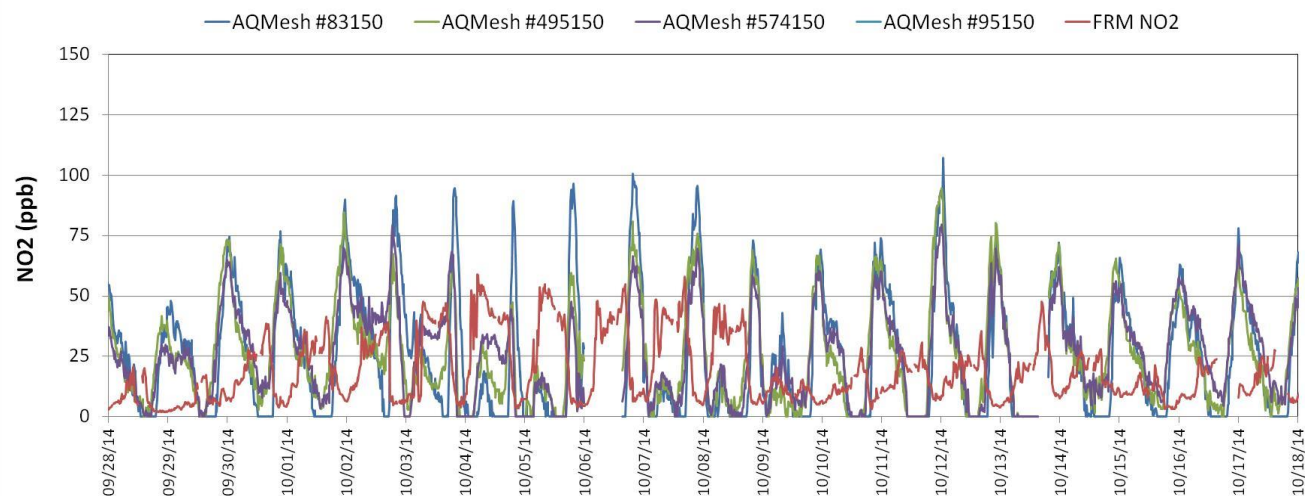


# AQMesh vs FRM (O3 and NO2; 15-min ave)

AQMesh vs FRM O3

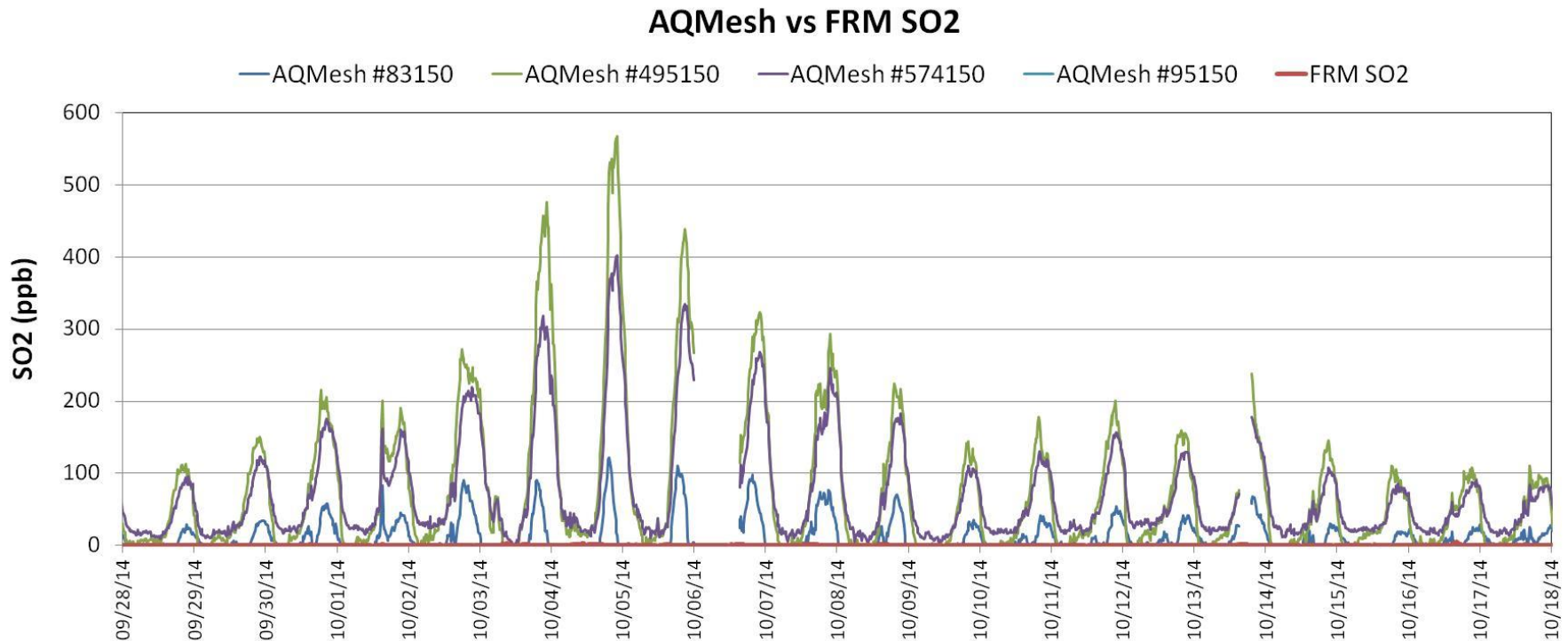


AQMesh vs FRM NO2



- AQMesh sensors do not seem to track the typical O3 and NO2 diurnal variations recorded by the FRM instruments
- Potential O3 and NO2 interference (to be investigated further during chamber experiments)

# AQMesh vs FRM (SO<sub>2</sub>; 15-min ave)



- Complete lack of correlation between AQMesh and FRM SO<sub>2</sub> measurements
- AQMesh SO<sub>2</sub> data is largely overestimated

# AQMesh vs FRM (All pollutants; 1-hr ave)

## Correlation Coefficient (R2) Matrix

		AQMesh ID#: 83150					AQMesh ID#: 495150				
		<i>NO</i>	<i>NO2</i>	<i>CO</i>	<i>SO2</i>	<i>O3</i>	<i>NO</i>	<i>NO2</i>	<i>CO</i>	<i>SO2</i>	<i>O3</i>
FRM	<i>NO</i>	0.89	0.10	0.57	0.03	0.11	0.76	0.08	0.40	0.00	0.01
	<i>NO2</i>	0.37	0.06	0.52	0.00	0.16	0.32	0.07	0.56	0.03	0.15
	<i>CO</i>	0.62	0.05	0.85	0.02	0.15	0.54	0.09	0.76	0.03	0.04
	<i>SO2</i>	0.56	0.07	0.35	0.02	0.04	0.31	0.02	0.20	0.00	0.02
	<i>O3</i>	0.31	0.25	0.31	0.06	0.54	0.26	0.46	0.31	0.26	0.34
		AQMesh ID#: 574150					AQMesh ID#: 90150				
		<i>NO</i>	<i>NO2</i>	<i>CO</i>	<i>SO2</i>	<i>O3</i>	<i>NO</i>	<i>NO2</i>	<i>CO</i>	<i>SO2</i>	<i>O3</i>
FRM	<i>NO</i>	0.86	0.05	0.41	0.00	0.11	0.84	0.03	0.63	0.00	0.12
	<i>NO2</i>	0.29	0.02	0.51	0.04	0.16	0.17	0.00	0.49	0.03	0.15
	<i>CO</i>	0.61	0.02	0.78	0.01	0.15	0.60	0.00	0.92	0.00	0.24
	<i>SO2</i>	0.42	0.02	0.27	0.00	0.05	0.41	0.01	0.52	0.00	0.08
	<i>O3</i>	0.33	0.17	0.28	0.32	0.43	0.33	0.01	0.61	0.07	0.26



# Discussion

- Overall, the CO and NO data measured using the AQMesh sensors correlate very well with the corresponding FRM data (high R<sup>2</sup>). However, data reliability may be an issue due to the wide intra-model variability between the four device tested
- The current version of the AQMesh does not provide reliable O<sub>3</sub>, NO<sub>2</sub>, and SO<sub>2</sub> data
- Chamber testing is necessary to fully evaluate the performance of the AQMesh over different environmental conditions
- Landtec is currently working on a new version of the AQMesh. Testing of this improved model will begin later this year
- All results are still preliminary